

## CLAIMS

1. A method of treating silica in an aqueous environment, comprising:
  - a) dispersing silica particulates in an aqueous environment to form an aqueous dispersion;
  - b) reversing the net charge of a surface of the silica particulates from negative to positive using a surface activating agent, thereby forming surface-activated silica particulates dispersed in the water; and
  - c) contacting the surface-activated silica particulates with organosilane reagents to form reagent-modified and surface-activated silica particulates.
2. A method as in claim 1, wherein the aqueous dispersion includes the surface activating agent prior to the dispersing step, and wherein the reversing step occurs as the silica particulates are dispersed in the aqueous dispersion portion-wise.
3. A method as in claim 1, wherein the surface activating agent is added to the aqueous dispersion after the silica particulates.
4. A method as in claim 1, wherein the dispersing step and the reversing step occur as the silica particulates and the surface activating agent are added to the aqueous environment simultaneously.
5. A method as in claim 1, wherein the aqueous dispersion includes from 10 wt% to 40 wt% silica particulates.
6. A method as in claim 1, wherein the dispersing step further comprises the use of a high shear or high torque mixer.
7. A method as in claim 1, wherein the aqueous dispersion includes silica particulates having an average size from 10 nm to 500 nm.

8. A method as in claim 1, wherein the surface activating agent is aluminum chloride hydrate.

9. A method as in claim 8, wherein the aluminum chloride hydrate is present in the aqueous dispersion at from 2 wt% to 20 wt%.

10. A method as in claim 1, wherein the surface activating agent is a trivalent or tetravalent metal oxide.

11. A method as in claim 10, wherein the trivalent or tetravalent metal oxide is adsorbed on the surface of the silica particulates.

12. A method as in claim 1, wherein the organosilane reagents are amine-containing silanes.

13. A method as in claim 12, wherein the amine-containing silanes include quaternary ammonium salts.

14. A method as in claim 1, further comprising the steps of monitoring and maintaining pH at a predetermined level during the contacting step.

15. A method of preparing an ink-jet media sheet, comprising:

a) dispersing silica particulates in an aqueous environment to form an aqueous dispersion;

b) reversing the net charge of a surface of the silica from negative to positive using a surface activating agent, thereby forming surface-activated silica particulates dispersed in the water;

c) contacting the surface-activated silica particulates with organosilane reagents to form reagent-modified and surface-activated silica particulates;

d) preparing a porous coating composition including the reagent-modified and surface-activated silica particulates and an organic binder; and

e) coating the porous coating composition on a media substrate.

16. A method as in claim 15, wherein the aqueous dispersion includes from 10 wt% to 40 wt% silica particulates.

5        17. A method as in claim 15, wherein the surface activating agent is aluminum chloride hydrate.

18. A method as in claim 17, wherein the aluminum chloride hydrate is present in aqueous dispersion at from 2 wt% to 20 wt%.

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19. A method as in claim 15, wherein the surface activating agent is a trivalent or tetravalent metal oxide.

20. A method as in claim 19, wherein the trivalent or tetravalent metal  
15        oxide is adsorbed on the surface of the silica particulates.

21. A method as in claim 15, wherein the organosilane reagents are amine-containing silanes.

20        22. A method as in claim 21, wherein the amine-containing silanes include quaternary ammonium salts.

23. Treated silica particulates for use in ink-jet media coatings, comprising silica particulates being surface-activated by a surface activating  
25        agent selected from the group consisting of an aluminum chloride hydrate, a trivalent metal oxide, a tetravalent metal oxide, and combinations thereof, and wherein the said silica particulates are also reagent-modified by an organosilane reagent.

30        24. Treated silica particulates as in claim 23, wherein the silica particulates are from 10 nm to 500 nm in size.

25. Treated silica particulates as in claim 23, wherein the organosilane reagent is an amine-containing silane.

26. Treated silica particulates as in claim 25, wherein the amine-  
5 containing silane includes a quaternary ammonium salt.

27. Treated silica particulates as in claim 23, wherein the silica  
particulates are surface-activated and reagent-modified in an aqueous  
environment.  
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28. Treated silica particulates as in claim 23, wherein the surface  
activating agent is aluminum chloride hydrate.

29. A media sheet having a treated silica particulate-containing coating,  
15 comprising:

a) a porous coating composition, including:

i) treated silica particulates being surface-activated by a surface  
activating agent selected from the group consisting of an aluminum  
chloride hydrate, a trivalent metal oxide, a tetravalent metal oxide, and  
20 combinations thereof, said treated silica particulates also being reagent-  
modified by an organosilane reagent, and

ii) a binder admixed with the treated silica particulates; and

b) a media substrate having the porous coating composition coated  
thereon.  
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30. A media sheet as in claim 29, wherein the silica particulates are from  
10 nm to 500 nm in size.

31. A media sheet as in claim 29, wherein the organosilane reagent is an  
30 amine-containing silane.

32. A media sheet as in claim 31, wherein the amine-containing silane includes a quaternary ammonium salt.

5 33. A media sheet as in claim 29, wherein the media substrate is photobase or paper.

34. A media sheet as in claim 29, wherein the silica particulates are surface-activated and reagent-modified in an aqueous environment.

10 35. A media sheet as in claim 29, wherein the surface activating agent is aluminum chloride hydrate.

36. A system for printing ink-jet images with minimal dye mobility, comprising:

- 15 a) a media sheet having a porous coating composition, including:
- i) treated silica particulates being reagent-modified and surface-activated in an aqueous environment, wherein the treated silica particulates have a net positive charge,
  - ii) a binder admixed with the treated silica particulates to form the
  - 20 porous coating composition, and
  - iii) a media substrate having the porous coating composition coated thereon; and
- b) an ink-jet ink having an anionic dye colorant configured for being
- 25 printed on the media sheet.

37. A system as in claim 36, wherein the treated silica particulates are surface activated by a member selected from the group consisting of an aluminum chloride hydrate, a trivalent metal oxide, a tetravalent metal oxide, and combinations thereof, and wherein the treated silica particulates are

30 reagent-modified by aluminum chloride hydrate.